

# SPECIAL EDITION

## Emerging Trends in Natural Resource Damage Assessment (NRDA)

# ENVIRONMENTAL PERSPECTIVES

The Newsletter of Exponent's Environmental and EcoSciences Practices

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# ENVIRONMENTAL PERSPECTIVES

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## NRDA Baseline “But for...?”

Rick Bodishbaugh, Ph.D.

### What is Baseline?

**Service level baseline incorporates any and all factors other than site-related chemical releases that modulate service levels in an assessment area, including both natural variability and human-caused impacts on service levels.**

The concept of service level baseline is simultaneously one of the most fundamentally important and most frequently misinterpreted components of NRDA. Simply put, it is the comparative basis against which injuries associated with both primary and compensatory restoration are measured, and is thus the basis for all calculated damages. While the primary focus here is CERCLA, baseline is an explicitly recognized concept under both CERCLA and Oil Pollution Act of 1990, and is defined by DOI and NOAA regulations as follows:

- DOI: “Baseline means the condition or conditions that would have existed at the assessment area had the discharge of oil or release of the hazardous substance under investigation not occurred” 43CFR§11.14(e).
- DOI: “Upon completing the Injury Determination phase, the authorized official shall quantify for each resource determined to be injured and for which damages will be sought, the effect of the discharge or release in terms of the reduction from the baseline condition in the quantity and quality of services, as the phrase is used in this part, provided by the injured resource using the guidance provided in the Quantification phase of this part” 43 CFR §11.70(a)
- NOAA: Baseline “means the condition of the natural resources and services that would have existed had the incident not occurred.” 15 CFR §990.30.
- NOAA: “Trustees must quantify the degree, and spatial and temporal extent of such injuries relative to baseline.” 15 CFR §990.52.

In short, the service level baseline incorporates any and all factors other than site-related chemical releases that modulate service levels in an assessment area, including both natural variability and human-caused impacts on service levels.

## Why Does Baseline Matter?

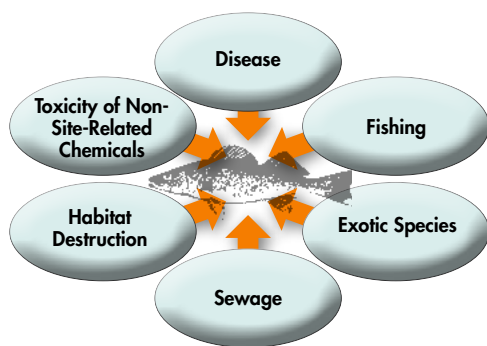
Baseline applies to both human uses and ecological services, and must be considered for both. Inadequate consideration of ecological service baseline factors is a particularly common problem. Though the following list is far from comprehensive, all of the following are examples of elements that determine baseline ecological service levels:

- Physical disturbance (e.g., clearing, filling, grading, dredging, mining)
- Infrastructure development (e.g., construction, demolition, paving, presence of buildings, tanks, equipment, or vehicles)
- Industrial activity (e.g., vehicle traffic, human movement, noise, non-hazardous runoff, other spills, thermal plumes in air or surface water)
- Non-hazardous chemical releases from the site
- Permitted chemical releases from the site
- Hazardous chemical releases from non-site-related sources (i.e., local background)
- Natural habitat loss (e.g., subsidence)
- Natural introduction of chemicals (erosion, oil seeps, etc.)
- Destruction of habitat from storm activity.

While these diverse factors can all have a profound impact on service levels, up to and including complete elimination of some types of services, none of them can result in compensable injury, as defined by the NRD authorization under CERCLA. At any site undergoing NRDA, teasing apart the impacts on services from chemical releases relative to baseline factors is therefore a critical step in the injury assessment that will determine the magnitude of compensable injury and damages.

## Baseline Variability

**In practice, the single perfect reference site never exists, and it is usually preferable to employ data from multiple reference areas that cover a range of baseline conditions.**



Example of baseline factors affecting a fishery

Ideally, baseline is established through the use of biological and chemical data from reference areas that have all factors in common with the assessment area other than site-related chemical releases. Baseline can also include applicable pre-release resource data such as fish and bird populations. In practice, the single perfect reference site never exists, and it is usually preferable to employ data from multiple reference areas that cover a range of baseline conditions. Things are further complicated by the fact that baseline at any site is both spatially and temporally variable. This fact is especially important at large sites, and for establishing injury timelines that span decades, as is often the case at many complex CERCLA sites. Baseline service levels in an active manufacturing area of a plant are likely to be quite different from those in an undeveloped buffer area surrounding the same plant. Current baseline service levels at any location can be expected to vary significantly from those that existed in 1950, and even more from pre-industrial baseline service levels. Establishing current baseline can be very challenging, but perhaps the single most difficult task in NRDA is reconstruction of historical baseline and injury. Depending on the resources involved, site setting, and available data, a variety of modeling and historical research approaches may be used, but any assumptions about historical baseline should be based on a technically defensible model of service flows over time. The more defensible the baseline timeline, the more defensible the resulting injury and damage calculations become. It is also important to consider that baseline service level trends are not necessarily unidirectional. Whereas site development for industrial use generally decreases baseline service levels, current baseline may be higher than historical levels as a result of factors like changes in local land use, or improvements in water quality.

## Difficulties in the Establishment of Baseline

**Documentation of the presence of oil or hazardous chemicals can be straightforward, but increasingly involves the use of forensic techniques such as chemical fingerprinting in order to differentiate those chemicals derived from background sources and those from the release(s).**

To a certain extent, baseline and the chemical background component of baseline, is often poorly quantified because complete quantification is difficult. Documentation of the presence of oil or hazardous chemicals can be straightforward, but increasingly involves the use of forensic techniques such as chemical fingerprinting in order to differentiate those chemicals derived from background sources and those from the release(s). Determination of source and time of releases is much more complicated, and chemistry data alone cannot define baseline. Full evaluation of all baseline factors requires data that are typically not collected during routine site characterization, including information on the nature and timeline of non-Site-related development and activities. Techniques such as geochronology through sediment coring, for example, can help to establish historical, time dependent deposition of baseline chemicals.

Any defendant facing a damage claim should independently and rigorously evaluate potential baseline factors and critically review Trustee injury assessments for adequate consideration of baseline. In cooperative assessments and negotiated settlements, the baseline concept should be explicitly addressed throughout the process. Availability of data, particularly historical data, is often a limiting factor, but identification of the types of data required for complete characterization of baseline should always be an early priority in an NRDA defense. Once data gaps are identified, a cost-benefit and feasibility assessment can be performed for acquisition of the necessary data, either through studies or review of previous research.



## Implicit Assumption of Pristine Baseline

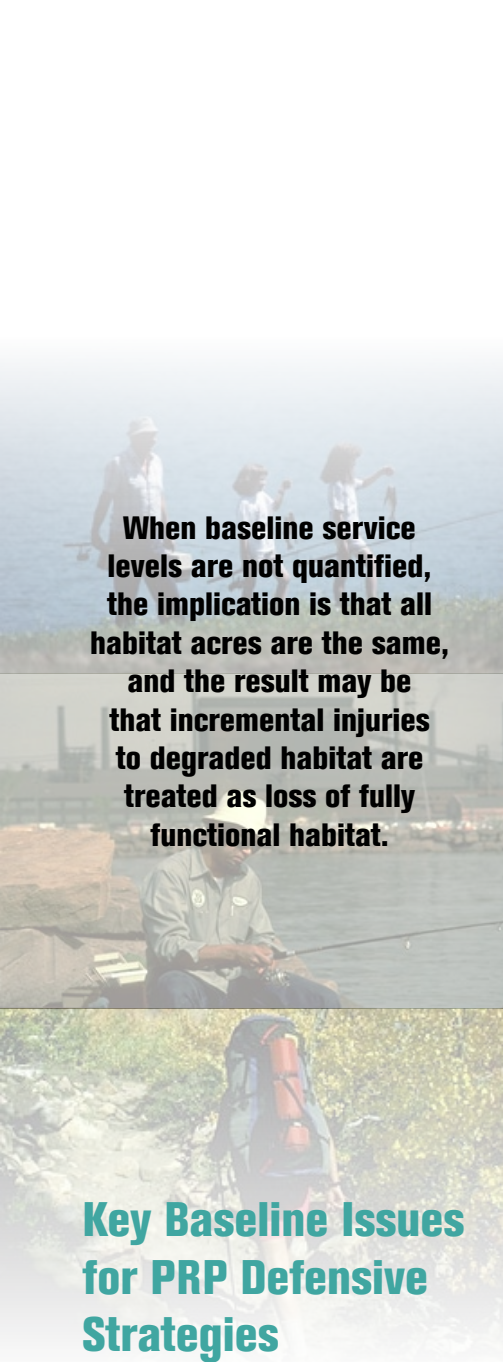
**“In the Quantification phase, the extent of the injury shall be measured, the baseline condition of the injured resource shall be estimated, the baseline services shall be identified, the recoverability of the injured resource shall be determined, and the reduction in services that resulted from the discharge or release shall be estimated” (43CFR§11.70(c)).**

Quantification of baseline service levels is a clear requirement of federal NRDA guidance:

“In the Quantification phase, the extent of the injury shall be measured, the baseline condition of the injured resource shall be estimated, the baseline services shall be identified, the recoverability of the injured resource shall be determined, and the reduction in services that resulted from the discharge or release shall be estimated” (43CFR§ 11.70(c)).

Nevertheless, a comprehensive quantification of baseline service levels and contamination is rarely conducted. The popularity of habitat equivalency analysis (HEA) as the primary method for quantifying injury and required restoration at many NRDA sites may have contributed to this trend. HEA is a highly useful tool, particularly in the context of settlement negotiation, but quantifying injury and restoration solely in terms of habitat discounted service acre years (DSAYs) can obfuscate the underlying services and any causal relationship between site-related chemical releases and service levels. Pursuit of a restoration-based settlement, even one developed cooperatively with Trustees, does not reduce the importance of a careful baseline evaluation. Baseline service levels are easily incorporated into HEA models through selection of appropriate service metrics and the use of habitat scaling factors, but many HEA-based assessments suffer from inadequate baseline measures. Selection of service metrics for HEA is a particularly important topic that is described by NOAA guidance (NOAA 2006), and has been extensively reviewed in a number of recent publications (Allen et al. 2005; Dunford et al. 2004; Zafonte and Hampton 2007).

The most serious aspect of a failure to adequately characterize and quantify services is the implication that baseline is equivalent to the service levels provided by pristine, fully functional habitat. This is rarely the case at industrial sites undergoing NRDA, especially in urban environments. While injury assessments can and sometimes do explicitly define baseline as pre-development, ideal conditions, such a claim can be directly evaluated and, if necessary, challenged. When baseline service levels are not quantified, the implication is that all habitat acres are the same, and the result may be that incremental injuries to degraded habitat are treated as loss of fully functional habitat. In such situations, the baseline reference becomes a worst case scenario.



**When baseline service levels are not quantified, the implication is that all habitat acres are the same, and the result may be that incremental injuries to degraded habitat are treated as loss of fully functional habitat.**

## Key Baseline Issues for PRP Defensive Strategies

While federal guidance regarding application of baseline under CERCLA is clear, the situation under state law is less so. Statutes authorizing state agencies to claim damages to trust resources vary widely. Some mirror CERCLA, but others differ significantly in many ways, including retroactivity and the explicit requirements of Trustee entities to incorporate service level and baseline quantification into their claim. Some, like the New Jersey Spill Act, explicitly enable the recovery of damages based on a pre-industrial rather than a “but for” baseline of services and related chemical contamination. Some states are virtually silent on guidance for conduct of NRDA, effectively leaving it to the discretion of the Trustee agency and ultimately the state courts, which may have little or no experience with established NRDA practice or guidance. To the extent that it exists, relevant state policy and case law is evolving rapidly and significant differences still exist between jurisdictions. Setting baseline at pristine or even pre-European colonization levels is one approach that is being employed, particularly in state courts. Even in the absence of prescriptive guidance, the best defensive strategy is always to rely on sound science and quantifiable measures of injury to defend against speculative demands for damages. Fact-based evaluation and application of baseline service levels is a powerful defensive strategy in any NRDA.

Each NRDA site is unique, and there truly is no one-size-fits-all approach to constructing a NRDA defense. However, the following preliminary checklist of baseline issues can be useful at all sites under all NRDA scenarios, whether simply evaluating potential liability, entering into a cooperative assessment or settlement negotiation, or facing active litigation.



**Establish a timeline of chemical releases with the potential to injure resources**—

Typically, this can be constructed from site records and characterization data. Dates, quantities, extent, and nature of substances released should all be characterized to the degree possible. Data gaps should be noted. Because of historical discounting, injuries in the distant past can have high present values, so historical releases should not be ignored, even if the data are relatively weak.

- ✓ **Clearly identify potentially injured resources and services associated with them**—Begin by enumerating types of habitat and human uses potentially impacted by releases. For each resource type, describe services that flow from the resource and potential diminutions that may occur with injury. For example, contaminated sediments may support a benthic community (base of aquatic food web), as well as serve as a secondary source for chemical exposure of higher order receptors (fish, wildlife, and humans).
- ✓ **Identify potential baseline factors associated with services**—Describe both site-related and non-site-related factors influencing identified service levels over the timeline of potential injury. Anything that has influenced the service level that would exist but for the release is potentially important. Has there been clearing, filling, or dredging? Has the surrounding area been developed? What local point and nonpoint sources for chemical contamination have existed? What local and regional pressures are there on the resource in question?
- ✓ **Describe data needed to fully quantify baseline over relevant timeline of injury**—Identify the types of data needed to fully describe baseline service levels over time. Examples include history of both site and non-site development and releases, adjacent site characterization data, fishing records for local waters, water quality data, and independent resource assessment information. Many of these data may not exist, and complete quantification of all aspects of baseline may be impossible or infeasible. A thorough evaluation of data needs and gaps, however, will permit a rational evaluation of the costs and benefits associated with pursuit of additional data.

Independent completion of the checklist above will greatly facilitate later interactions with Trustees. Following initiation of a dialog with Trustees, whether it is an informal discussion, receipt of a pre-assessment screen, or notice of intent to sue, the information described above can be used to evaluate the legitimacy of a potential claim. The following questions should be critically asked of any Trustee position:



**Early establishment of a scientifically valid baseline service quantification provides critical technical underpinning for the entire damage assessment.**

### *Are services explicitly identified and described?*

Be sure that Trustees identify allegedly injured services, not just releases or presence of contamination. Do the Trustees accurately describe the potentially injured services? Do all described services actually occur at the site? For example, if groundwater injury is alleged based on drinking water standards, is there any actual or planned usage of the aquifer as a drinking water source?

### *How are service losses quantified?*

Do Trustees describe quantifiable service metrics, or simply rely on acreage of contamination? Are described metrics directly related to service levels? Is there a causal relationship between service metrics and release-mediated injury?

### *What baseline factors influence the services and metrics selected by Trustees?*

How do the baseline factors identified for the site potentially influence service levels? Will they be adequately accounted for by the service metrics used by Trustees to quantify injury, or do adjustments need to be made? Do Trustees account for changes in baseline over time?

### *Does the Trustee position adequately incorporate a quantitative measure of baseline services?*

Is habitat degradation resulting from baseline factors properly accounted for in injury quantification or HEA habitat scaling factors? Are there important aspects of baseline that are not accounted for in the Trustee position?

Exactly how baseline determination plays into the NRDA process at a given site or case will vary widely, but the importance of baseline is universal. Early establishment of a scientifically valid baseline service quantification provides critical technical underpinning for the entire damage assessment. Whether in litigation or negotiation with Trustees, this underpinning is critical. Failure to accurately identify and incorporate key baseline issues into the assessment may lead to overestimation of injury and damages, or to a vulnerable settlement agreement that cannot be justified with sound science.

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# Considerations for Early Restoration and Cooperative Assessments in the NRDA Process

Johanna Salatas and Pieter Booth

The practice of NRD has evolved considerably over the past 25 years, and experienced NRD practitioners often talk about two general approaches to resolving NRD liability: cooperative assessment and litigation. These approaches are not mutually exclusive and it is not unusual for an NRD case to begin on one track and eventually be resolved on another. It is also not unusual to prepare for possible litigation while pursuing a cooperative assessment. Regardless of the approach, the goal of NRDA should be to achieve, and where possible, to expedite both primary and compensatory restoration. Expediting restoration can reduce transaction costs by shortening the NRD process and it can result in reduced liability associated with service losses. In this article, we discuss the beneficial role of expedited restoration planning and implementation in the settlement of NRD liability, and the potential benefits and problems that can result from various approaches. We also discuss expedited restoration-based settlement and settlement up-front as emerging approaches in the NRD arena, as well as key issues that should be considered by PRPs prior to undertaking early restoration to settle NRDA claims.

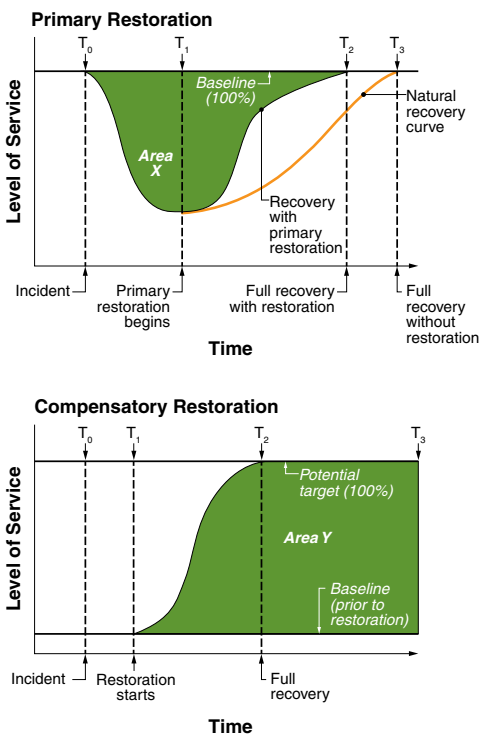
## Benefits of Early Restoration

Early restoration is beneficial because it promotes restoration through collaborative and incentive-based interactions between PRPs and Trustees. Early restoration creates benefits in the near future instead of following the lengthy formal NRDA process (either with or without litigation), thus reducing the overall amount of compensatory restoration needed to offset liability for lost services. Early restoration can also significantly reduce the transaction costs associated with extensive scientific and legal engagements. While scientists and attorneys are invariably involved in the process of early restoration discussions, this latter benefit is often an enticement for Trustees

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to enter into agreements for early restoration because they understand the reality that many PRPs have limited resources to go toward resolving liability. Thus early restoration is often viewed as a win-win prospect when limited resources are spent on restoration, as opposed to study and litigation.

Perhaps the greatest advantage to early restoration is that it can potentially decrease the overall costs of restoration for PRPs because of the time-value of money. To illustrate this, habitat equivalency analysis (HEA) can be used to calculate the amount of restoration that would be needed for various hypothetical scenarios. HEA is particularly useful for service-to-service scaling to help settle NRD claims. Simply put, HEA equates the present value of lost services in the past and future to the present value of future services provided by restoration actions. This is accomplished by applying standard net present value analysis methods to discount injuries or restoration benefits over time, and scaling factors that standardize the services provided by injured and restored habitats.



Source: NOAA Coastal Services Center (2010)

The concept of the accrual of service losses or gains over time is illustrated in the figure to the left, where natural resource injury resulting from a release at  $T_0$  is represented by Area X. Area X, then, is the reduction in services over time relative to baseline conditions. Primary restoration is conducted at  $T_1$ , and following primary restoration, services return to their baseline (without release) condition at  $T_2$ . Recovery to baseline without primary restoration does not occur until  $T_3$ , and occurs at a much slower recovery rate than if primary restoration is pursued. Area Y in the bottom part of Figure 1 represents the gain in services (from compensatory restoration) necessary to fully offset the losses illustrated as Area X. Compensatory restoration is undertaken at  $T_1$  to compensate for "interim service losses", or those services lost from the time of the release at  $T_0$  (or 1980, the enactment of CERCLA) up to a time in the future when services are expected to reach their potential target at  $T_2$ . Services increase either as a result of primary restoration, natural restoration, or a combination thereof. Because service losses and service gains are compounded over time in an NRD action, it is clear that benefits may be generated by speeding up either primary restoration, or compensatory restoration, or both.

Undertaking early restoration should be considered with caution by PRPs. Trustees may be reluctant to commit to settling NRD liability (e.g., issuing a covenant not to sue) without having conducted a formal assessment of service losses and gains. Instead, this approach will be most attractive to PRPs in cases where there are good opportunities for cost-effective restoration and the risk of “over-compensation” does not carry a substantial monetary penalty. An example of such a case may be a relatively small site with a simple release and injury profile, where the PRP can offer a cost-effective restoration package that is highly desirable to Trustees.

## Cooperative Assessments



**The overall goal is parallel tracking of the evaluation of injury/service losses and development of restoration projects so that an ultimate conclusion can be reached relatively quickly.**

Cooperative assessments have been used to resolve NRD liability in many NRD cases. Although such assessments can take many different forms, they usually involve the establishment of some type of working agreement among the PRPs and Trustees. These agreements can take the form of a comprehensive and detailed Funding and Participation Agreement, or they may simply be agreements to proceed forward with the assessment in general terms with some commitment on the part of PRPs to reimburse Trustee participation costs.

The process in most cooperative assessments is joint agreement on study plans and collection of needed data. However, the overall goal is parallel tracking of the evaluation of injury/service losses and development of restoration projects so that an ultimate conclusion can be reached relatively quickly. A secondary goal may be to parallel track the NRD process with ongoing site investigations being conducted under CERCLA, RCRA, or a state hazardous waste cleanup program. The advantage of cooperative assessments is that they can often foster an efficient resolution of key technical issues, freeing resources and time to develop a restoration-based solution. Such assessments also can lead to lower transactions costs by streamlining Trustee oversight, and reducing PRP and Trustee legal and consulting costs. Cooperative assessments also can lead to a more timely determination of restoration alternatives.

Early restoration may gain favor in some cases that are actively undergoing response actions, and where such actions provide opportunities for the prompt generation of resource services. There may be opportunities for PRPs to implement cost-effective enhancements or modifications to remedial

designs, which can result not only in cost savings, but also in credits to offset compensatory restoration.

Whenever there is a need to conduct primary restoration, any design ideas that increase ecological services and enhance recovery above baseline conditions should be discussed and incorporated into the remediation plans early in the process. Cooperative assessments provide a forum for allowing Trustees and PRPs to offer their ideas and discuss beneficial enhancements that can be undertaken as part of primary restoration.

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If working under the terms of cooperative assessment, PRPs are strongly encouraged to engage Trustees in detailed discussions regarding the effect of remediation (primary restoration) on ecological services. For example, Trustees may claim injuries as a result of the destruction of benthic communities during dredging. As a result, PRPs may wish to enter into discussions with Trustees early, to identify actions that can be built into the remedial design to avoid or mitigate potential damages from the remediation (primary restoration) itself. The cooperative assessment approach affords opportunities to avoid potential problems that may arise during primary restoration.

Cooperative assessments are not automatically the best choice for resolving NRD liability. Some Trustees may view cooperative assessments as little more than a means to obtain funding for studies while providing PRPs with little or no involvement in the design or execution of the studies. It is worth exploring cooperative assessment with the Trustees if there is a clear need to collect additional data or conduct studies to adequately quantify lost services, and if favorable terms can be negotiated for PRP involvement. However, if the process begins to break down, another approach, such as moving to a parallel damage assessment, or moving to the litigation track, may be necessary.

A cooperative NRD process provides an administrative and procedural framework for pursuing an expedited restoration-based settlement, or engaging in a process whereby restoration is pursued at the beginning of the NRD process rather than at the conclusion. These special cases of cooperative assessment are described as follows.

## Expedited Restoration-based Settlement



An expedited restoration-based settlement is likely to be feasible only when PRPs and Trustees are actually engaged in a cooperative assessment. Such a settlement is possible for the majority of situations that are neither too complex nor politically contentious. Where not precluded by the situation, the expedited approach places emphasis on identification of projects that are most likely to provide significant ecological and human use services, rather than a more traditional NRDA process wherein restoration is typically addressed only after injury and service losses have been characterized. Projects are identified based on regional ecological considerations and with little quantitative consideration of the balance between services lost as a result of the release (e.g., NRD liability) and services gained through restoration project(s).

The *primary disadvantage* of this approach is incurring the risk that a PRP will perform more restoration than is needed to resolve its liability, or that resources expended on restoration will not ultimately be awarded the desired level of credit by Trustee entities. An expedited approach may also require the PRP to agree to an NRDA reopener in order to protect the trustees from unexpected future findings.

The *primary advantage* is in the potential for lower transaction costs resulting from less emphasis on quantification of injury and lost services; however, these foregone costs need to be carefully evaluated relative to the risk of over-compensating for actual liability.

## Restoration Up-Front

“Restoration up-front” is an idea that was originally championed by NOAA (API/NOAA 2006), but is increasingly being pursued by other federal and state Trustees. This type of approach is most likely to gain the attention of Trustees in cases where Trustees or nongovernmental organizations have unmet or particularly time-critical restoration priorities in the same geographic area as an NRD claim. An important concept underlying the restoration up-front approach is that it affords PRPs and Trustees the

**This type of approach is most likely to gain the attention of Trustees in cases where Trustees or nongovernmental organizations have unmet or particularly time-critical restoration priorities in the same geographic area as an NRD claim.**

“opportunity” for cost-effective implementation of restoration on a regional scale (Liu et al. 2007). Although interesting in concept, the restoration up-front approach has been generally suitable only in simple NRD cases where the PRP was able to readily and cost-effectively provide a highly desirable package of restoration projects. Restoration up-front is less likely to be successful in complex NRD cases, such as large areas that encompass diverse aquatic and terrestrial habitat and complex political and socioeconomic dynamics.

Another aspect of restoration up-front that is currently being explored is the concept of banking restoration credits. The idea behind restoration up-front is intended to reduce the time and costs associated with restoration and perhaps lead to an increase in voluntary restoration and conservation nationally (Stahl et al. 2008). For example, if properties owned by companies have valuable ecological characteristics and attributes, such as wetlands, streams, riparian habitats, or prairie, it might be more beneficial for companies to place the property into a framework that would allow the owner an efficient and less costly means of resolving existing or future liabilities, or liabilities in a different geographical area. However, a major challenge to this concept is that there are no federal or state policies in place that detail or support these transactions (Liu et al. 2007).

## Conclusions

Early restoration creates benefits for PRPs by 1) achieving quicker settlement and thereby avoiding costs associated with lengthy and complex NRDA processes, and 2) reducing the amount of compensatory restoration needed to offset liability for lost services. Initiation of restoration sooner rather than later is always theoretically advantageous from a present value standpoint; however, this benefit needs to be weighed against other PRP prerogatives including management of overall environmental liability and potential effects on other NRD claims or environmental litigation.

In addition to early restoration, incorporation of restoration into remedial design can significantly decrease mobilization and implementation costs. However, PRPs should be careful to discuss the options, preferences, and liability offsets with Trustees prior to committing to enhanced remediation or NRD-associated restoration. There is much discussion among NRD practitioners and PRPs regarding expedited restoration-based settlements

and strategies for pursuing restoration up-front or restoration banking; however, there is currently little experience with these approaches, and no policy has yet been developed to reduce the uncertainty and risks to PRPs.

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# The Environmental Liability Directive: The European Counterpart to U.S. Natural Resource Damages Regulations

Nicholas Gard, Ph.D.

The Environmental Liability Directive 2004/35/EC (ELD) is a European Union (EU)-wide regulation that holds operators liable for damages to natural resources caused by their activities. Modeled on natural resource damage (NRD) regulations in the USA, the ELD potentially expands liability management concerns for companies dealing with NRD issues in the U.S., but also maintaining facilities in international locations. For European companies with no prior exposure to NRD liability, the directive will raise questions and challenges that are familiar to U.S. NRD practitioners. In either case, the tools applied and lessons learned from U.S. NRD cases provide valuable management strategies when addressing ELD cases.

## Key Features of the ELD

The central objective of the ELD is to prevent damage to the environment (water, protected species and natural habitats, and land) and in cases where any action carried out in the course of an economic activity has resulted in environmental damage, hold the responsible party liable for the costs to remedy that damage.

The ELD is a two-tier liability system. Operators of specific listed activities, including installations subject to an environmental permit, such as an integrated pollution prevention and control (IPPC) permit; waste management facilities; authorized water abstraction and impoundment; or manufacture, use, storage, processing, and transport of dangerous substances and products or genetically modified organisms are strictly liable for any damage to protected species and habitats (i.e., biodiversity), water, or land caused by their activities. Operators of other types of facilities are liable for damage to biodiversity, but only when that damage



arises from operator fault or negligence. In cases where an operator is liable for environmental damage, they are responsible for undertaking primary remediation to restore damaged natural resources to their baseline condition, and for compensatory remediation to account for interim losses.

Unlike NRD legislation, the ELD is not retroactive, applying only to incidents occurring after transposition of the directive into national legislation in each of the 27 EU Member States (MS), which was completed this year. The ELD provides minimum requirements for national legislation, but many countries have adopted stricter requirements by limiting applicability of several stated defenses, or by expanding the range of protected species and habitats or the activities subject to strict liability. Additionally, some countries, such as Spain and Greece, require compulsory environmental insurance, while it is currently voluntary in others. The diversity in interpretation of the ELD among the 27 MS, and in some cases within geopolitical units of the countries, represents a further challenge for companies with multi-national operations.

## Technical Challenges

Based on our experience with NRD cases in the USA, Exponent has identified several key technical issues that are likely to present challenges to operators and MS authorities when incidents subject to the ELD arise in the future.

**Significance**—For the ELD to apply, damage must be determined to be significant. The ELD defines significant damage as that which is judged to adversely affect the conservation status of species and habitats (e.g., by causing a decrease in population size or range) or the ecological and chemical status of waters, as determined by environmental objectives defined under the EU Water Framework Directive 2000/60/EC. Although some descriptive examples of favourable conservation and ecological status are provided in the ELD, the lack of a precise definition places the burden on MS authorities to make the determination of significance. This may result in considerable variation of interpretation between countries and uncertainty on the part of operators for determining whether their operations have resulted in a significant effect. Some countries, such as England, have issued guidance to help explain how significance is to be determined, but it is anticipated that there will be some ambiguity and uncertainty surrounding this determination, especially in early case applications of the ELD.

**Establishing an accurate baseline is a complex process that requires critical reconstruction of historical data, modeling, and reference-area comparison.**

**Causation**—Procedures for establishing causation are not specified in detail in the ELD, but causation must be evaluated to determine whether observed effects on species and habitats are a result of the release or spill under investigation, particularly if those effects are deemed to have significant adverse effects on natural resources or service flows. The first ruling on the ELD by the European Court of Justice has important relevance to the concept of causation. In a March 2010 ruling on the Italian Augusta Roadstead case (Case C-378/08), the court established weak requirements for authorities to establish a rebuttable presumption of causation in cases of diffuse pollution, requiring only the presumption of a causal link. Causal approaches have been explored and refined over the years. For example, the U.S. Environmental Protection Agency (U.S. EPA) provides a causal analysis framework in the Stressor Identification Guidance (U.S. EPA 2000). Exponent also compiled a series of papers to evaluate the state-of-the-science of causal analysis (Wickwire and Menzie 2010).

**Baseline**—As with NRD, baseline (see related story in this publication), the environmental status but for the incident, is an important technical issue in the ELD, because it is the basis for determining environmental significance, establishing remediation goals for resource services (primary and complementary remediation), and quantifying “lost use” damages or compensatory remediation. Establishing an accurate baseline is a complex process that requires critical reconstruction of historical data, modeling, and reference-area comparison. Our experience with NRD cases indicates that authorities often inadequately characterize baseline. Companies facing liability under the ELD need to critically evaluate the extent to which a detailed quantification of baseline is necessary, which may become clearer as more incidents are assessed under the ELD.

**Technical Approaches**—The preferred technical methods for calculating environmental damage and required remediation under the ELD rely on scaling methods, such as habitat or resource equivalency analysis (HEA/ REA). HEA and REA methods were originally developed by U.S. NRD trustees to estimate compensatory replacements for natural resource service losses and the scale of compensatory restoration required to offset those losses. The principle behind these equivalency methods is that compensatory restoration can be achieved through “replacement” of equivalent habitats and resources. Exponent has had extensive experience using HEA as the foundation for successful closure of natural resource damage liability in U.S. cases. A major benefit of the method is that it

avoids monetization of damages by focusing on cost-effective habitat restoration options. We anticipate that similar benefits can be realized under the ELD with its focus on equivalency analysis. However, as in the U.S., the same technical issues will be central to successful settlement, including baseline, service and metric selection, injury quantification, and selection and scaling of remediation projects.

## Conclusion

**Looking for synergies with best practices developed through experience in the U.S. may be desirable to reduce complexity, lessen uncertainty, and promote a cost-effective settlement.**

For companies and individuals experienced with NRD practices in the U.S., the EU ELD will seem relatively familiar from a technical standpoint, should they be faced with an incident subject to the directive. For others who have had limited exposure to NRD, looking for synergies with best practices developed through experience in the U.S. may be desirable to reduce complexity, lessen uncertainty, and promote a cost-effective settlement. At present, the greatest unknown for all parties potentially affected by the ELD is the lack of case histories. Full transposition of the directive to national regulations in all MS was only completed this year. Some incidents that are subject to the directive are currently under investigation, but unlike for damage assessment in the U.S., at present there are no completed cases forming a precedent for future cases. Therefore, companies experiencing an incident subject to the ELD in the early stages of the directive are advised to ensure that assessment methods are applied using sound technical methods, consistent with the state of the science, and that damage is accurately quantified so that required remediation is commensurate with the severity of the incident.

Operators who anticipate that their activities may fall under the scope of the ELD can take some proactive measures to evaluate the magnitude of their potential liability. Analysis of facilities and transportation networks can be undertaken to evaluate locations in relation to the occurrence of protected species or habitats. Operator activities can be evaluated to identify those that could most likely result in significant environmental damage in the event of an unplanned incident. In one such approach, Exponent used a tiered evaluation of environmental risks of facilities for a major manufacturing firm. For an analysis of offsite liabilities, facilities were evaluated for: 1) the potential to be a source of chemicals, 2) the potential for release of chemicals during site operations or storage, 3) the potential for offsite transport of chemicals, and 4) the potential for exposure of humans and the environment to chemicals.

## References

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## Exponent NRDA Specialists

### Paul D. Boehm, Ph.D.

Dr. Paul D. Boehm has overall responsibility for Exponent's Environmental business. He has devoted his 34 years of consulting experience to advising industrial, legal, and government clients on scientific aspects of contaminated sediments and terrestrial sites, major oil spills, and the use of environmental forensic methods to investigate background contamination, to chemically fingerprint contaminants to determine sources, to apportion contamination to allocate liabilities, and to reconstruct historical releases and doses. He has been engaged in numerous natural resource damage assessments (NRDAs) at oil spill and CERCLA sites where he has provided technical support on chemical sources, exposure and bioavailability, divisibility of contamination, apportionment, and allocation of associated liability. His extensive knowledge of the strategic application and practice of injury assessment, environmental forensics (geochemical fingerprinting, transport and fate, source attribution, and allocation) has been applied to numerous NRDA cases involving complex scientific and litigation matters.

Dr. Boehm has also provided scientific support to clients on environmental and toxic tort claim, maritime pollution cases, and other litigation matters, including providing expert testimony. His work as an analytical, environmental, and geochemist has involved petroleum hydrocarbons, fuel additives, natural gas, PAHs, PCBs, chlorophenols, chlorinated solvents (TCE, PCE), and other chemicals. A significant part of Dr. Boehm's work has focused on marine oil spills; contamination at oil refineries, fuel terminals, and offshore platforms; Superfund sites; manufactured gas plants (MGP); pulp and paper mills, and natural gas storage fields; medical exposures; and transactional disputes.

He has published more than 100 papers in peer reviewed journals, was appointed to serve on several national panels on environmental/ marine pollution, and has served on several National Research Council panels. He holds a B.S. (Chemical Engineering) from the University of Rochester, and M.S. and Ph.D. degrees (Oceanography) from the University of Rhode Island.

### Charles A. Menzie, Ph.D.

Dr. Charles A. Menzie is a Principal Scientist and Director of Exponent's EcoSciences practice. His primary area of expertise is the environmental fate and effects of physical, biological, and chemical stressors on terrestrial and aquatic systems. Over the past two decades, most of this work has focused on chemicals. Dr. Menzie has worked at more than 100 hazardous waste sites, including many high-profile Superfund Sites. He has also been involved in approximately a dozen NRDA-related cases. Dr. Menzie has extensive experience with state and federal regulatory agencies. He has provided oversight and management of hazardous waste sites affected by a broad range of contaminants, including solvents (TCE, PCE, TCA, and others), persistent chlorinated compounds such as PCBs, hydrocarbons, cyanides, and metals. Employing his deep understanding of risk-based studies and remediation, Dr. Menzie has directed the development of work plans, the implementation of remedial investigations, and the selection of remedial measures, on behalf of individual potentially responsible parties (PRPs), as well as

PRP groups. He has extensive litigation experience and has provided steady and compelling advice and guidance in many controversial and contentious situations.

Dr. Menzie is recognized as one of the leaders in the field of risk assessment and was awarded the Risk Practitioner Award by the Society for Risk Analysis. He has served on the Council of SRA and the Board of SETAC, the two major professional organizations in this field. Having led numerous peer reviews for industry and for government, he has taken the lead in developing guidance documents, focusing on methods that are workable and acceptable to a broad range of parties. He has developed and applied a formal causal-analysis methodology for assessing causation in cases of environmental impairment and contributions of chemical contamination. He was one of the committee members to draft the ASTM Standard for risk-based corrective action (RBCA) for chemical release sites and extended that standard to ecological considerations. Dr. Menzie holds a Ph.D. (Biology) from City University of New York, an M.A. (Biology) from City College of New York, and a B.S. (Biology) from Manhattan College.

## Thomas Ginn, Ph.D.

Dr. Thomas Ginn is a Principal Scientist in Exponent's EcoSciences practice, specializing in natural resource damage assessment and ecological risk assessment. He has conducted studies of the effects of inorganic and organic chemicals on aquatic and terrestrial organisms at sites nationwide. Dr. Ginn has specialized expertise in assessing the fate, exposure, and effects of substances such as PCBs, PAHs, dioxins, arsenic, cadmium, copper, lead, and mercury. He has provided support to industrial clients for natural resource damage assessments in Alaska, Arizona, California, Idaho, Indiana, Missouri, Montana, Massachusetts, Michigan, Minnesota, New Jersey, New York, Ohio, Oklahoma, South Carolina, Texas, Washington, and West Virginia. In these projects, he has worked closely with legal counsel during strategy development and settlement negotiations with state, federal, and tribal trustees. Dr. Ginn has performed detailed technical assessments of injuries to terrestrial and aquatic resources, including fishes, birds, and mammals, and has also developed innovative and cost-effective restoration alternatives. He has provided deposition and trial testimony concerning injury to aquatic and terrestrial resources. Dr. Ginn testified to the U.S. House of Representatives, Commerce Committee, concerning the natural resource damage provisions of Superfund reauthorization.

Dr. Ginn has authored many publications in the area of applied ecology. He has given numerous presentations and CLE seminars on risk assessment and natural resource damage assessment. Dr. Ginn has served as an expert witness concerning the effects of waste discharges and chemicals in sediments on aquatic organisms. He has also served on scientific advisory committees concerning management of contaminated sediments for Puget Sound, San Francisco Bay, and New York/New Jersey Harbor. Dr. Ginn testified to the U.S. House of Representatives, Commerce Committee, concerning the natural resource damage provision of Superfund reauthorization.

## Pieter Booth

Mr. Pieter Booth is a Principal in Exponent's EcoSciences practice. He has 28 years of experience as an environmental scientist and program manager specializing in natural resource damage assessment (NRDA), restoration of natural systems, and ecotoxicology and risk assessment. Mr. Booth is nationally recognized for his NRDA work, particularly for his role providing technical support to industry clients during restoration-based settlement negotiations. He has fulfilled this role for several of the largest NRDA cases in the country, including Saginaw River and Bay, Lake Hartwell/Twelvemile Creek, St. Lawrence River, Tittabawassee River, and others. In these roles, he has provided technical support to legal teams and supervision and preparation of materials for litigation support under CERCLA, RCRA, the Clean Water Act, and the regulatory programs of various states. Mr. Booth has served as consulting expert for issues related to exposure and ecological effects and developed expert reports for review by the International Court of Justice. He also directs and participates in environmental and social due diligence audits as required by multilateral banks for a variety of projects in the energy, transportation, and natural resources sectors. Mr. Booth has a particularly strong background in managing and directing evaluations of the potential impacts of PCBs and metals on fish, birds, and mammals; ecological risks posed by sediment contamination; and options for sediment management. Mr. Booth has developed and managed a corporate program for a Fortune 500 manufacturing company, to implement risk assessment guidance for program managers in the remediation group and provided site-specific ecological risk assessments at numerous sites nationwide.

Mr. Booth has led numerous projects directed at the characterization and remediation of contaminated sediments in the United States and South America, and he has helped to create guidance and policy for regional sediment management programs in Puget Sound and San Francisco Bay. He holds a B.A. (Biology) from the University of the Pacific, and an M.M.A. (Marine Affairs) from the University of Washington.

## Nicholas Gard, Ph.D.

Dr. Nicholas Gard is a Managing Scientist in Exponent's EcoSciences practice. He is an ecotoxicologist with more than 25 years of experience in avian and mammalian toxicology, ecology, and wildlife biology, and specializes in natural resource damage assessment (NRDA) and ecological risk assessment. Dr. Gard has been involved in more than a dozen NRDA cases where he has assessed injuries to sediment, fish, birds, and mammals from substances such as PCBs, dioxins, mercury, other metals, and PAHs, and applied equivalency analysis techniques to evaluate and scale restoration alternatives. He has conducted NRDA activities internationally, as well as in the states of California, Michigan, New Jersey, New York, Ohio, South Carolina, Washington, and Wisconsin. Example sites that he is currently involved in include Onondaga Lake, St. Lawrence River/Massena, and Tittabawassee River. Currently, he is also providing technical support to an industry group ([www.NRDonline.com](http://www.NRDonline.com)) on issues related to the implementation of the Environmental Liability Directive in the European Union.

In addition to NRD experience, Dr. Gard also has extensive expertise conducting ecological risk assessments, environmental impact assessments, and habitat evaluations in a variety of terrestrial, wetland, and estuarine ecosystems both in the United States and internationally, entailing evaluation of environmental effects for a number of industrial activities, including manufacturing facilities, mines, smelters, pulp and paper mills, refineries, pipelines, and agro-chemical operations. Dr. Gard holds a Ph.D. in Environmental Toxicology from Clemson University, a M.Sc. (Wildlife Ecology) from McGill University, and a B.Sc. (Wildlife Biology) from University of Guelph.

## **Rick Bodishbaugh, Ph.D.**

Dr. Rick Bodishbaugh is a Managing Ecotoxicologist in Exponent's EcoSciences practice, with 20 years of diverse experience in aquatic toxicology research, chemical and site assessment, ecological risk assessment (ERA) in aquatic and terrestrial systems, and natural resource damage assessment (NRDA). His specific areas of technical expertise include fish and wildlife toxicity assessment, resource/habitat equivalency analysis (REA/HEA), bioavailability of chemical contaminants in aquatic and terrestrial ecosystems, and chemical structure-activity relationships. Dr. Bodishbaugh's graduate research focused on the aquatic toxicology of synthetic surfactants and other organic pollutants. He also has formal training in marine biochemistry, molecular biology, and bioremediation principles.

Dr. Bodishbaugh has extensive NRDA experience, and has helped clients develop defensive and settlement strategies for NRDA claims by federal, state, and tribal trustees at sites in Alaska, California, Delaware, Indiana, Missouri, New Jersey, New York, Texas, and Washington. He is an expert in the application of REA and HEA, including applications for assessment of groundwater injury. He has worked closely with client legal teams to assess and critically evaluate the technical merits and costs of natural resource liability and settlement options, and has represented industry clients in both formal and informal trustee negotiations to arrive at rational injury assessments and cost effective, restoration-based compensation options. He has provided deposition testimony on NRD liability for east and west coast clients, and has both contributed to and critically reviewed numerous expert reports for NRD cases. Dr. Bodishbaugh holds a Ph.D. (Aquatic Toxicology) from Duke University and a B.S. (Chemical Engineering) from the University of Tulsa.

## Johanna Salatas

Ms. Johanna Salatas is a Senior Scientist in Exponent's EcoSciences practice. Her specific areas of technical expertise include ecological risk assessment and natural resource damage assessment and site remedial investigations, with emphasis on ecological restoration. Ms. Salatas has 13 years of experience in evaluating the exposure and effects of contaminated soil, groundwater, surface water, and sediments to ecological receptors. She is experienced in assessing risks of bioaccumulative chemicals, such as PCBs, dioxins, mercury, metals, PAHs, and pesticides, to aquatic and terrestrial wildlife, including threatened and endangered species, in sensitive habitats. Ms. Salatas has designed and implemented field studies to evaluate reproductive success and population dynamics of various avian and mammalian species, and has planned and conducted habitat restoration projects for riparian, wetland, and river environments. Ms. Salatas has been involved in innovative research to further the understanding of metals in soils and bioavailability to avian and mammalian receptors. She has particular interest in proactive and preventative risk management strategies, particularly in promoting ecological land reuse of remediated sites. Ms. Salatas has provided technical support for energy, petrochemical, pesticide, pulp and paper, manufacturing, and mining industry clients located throughout the United States. She holds two B.S. degrees (Zoology and Environmental Science) from the University of Washington, and an M.S. (Ecology) from the University of Florida.